'TRADER' SERVICE SHEET

195

HALCYON ROYAL COUNTY

3-BAND A.C. SUPERHET

SUITABLE for mains of 200-260 V, 40-100 C/S, the A.C. model of the Halcyon Royal County receiver is a 4-valve (plus rectifier) 3-band superhet with a short-wave range of 16-50 metres, and provision for an extension speaker. An identical chassis is fitted in the Royal County (A.C.) console, and there is a radio-gramophone with the same name and a very similar chassis, which, however, is modified to include the pick-up circuit. This *Service Sheet* was prepared on a table model.

It should be noted that there is another A.C. radio-gramophone with the same name which is actually fitted with the A.C./D.C. chassis dealt with in *Service Sheet* 158. It is described as an A.C. model on account of the fact that the motor used is not suitable for D.C.

CIRCUIT DESCRIPTION

Aerial input via **C1** and coupling coils **L2, L3** to inductively coupled M.W. and L.W. band-pass filter. Primary **L4, L5** tuned by **C19**; secondary **L9, L10** tuned by **C21**; coupling coils **L6, L7.** On S.W. band input is via **C2** to tapping on coil **L8,** which is tuned by **C21.**

First valve (**V1, Mullard metallised FC4**) is an octode operating as electron-coupled frequency changer. Oscillator grid coils **L11** (S.W.) and **L13, L14** (M.W. and L.W.) are tuned by **C22**; M.W. trimming by **C23**; tracking by **C24** (L.W.) and **C5, C25** (M.W.); oscillator anode reaction coils **L12** (S.W.) and **L15, L16** (M.W. and L.W.).

Second valve, a variable-mu R.F. pentode (**V2, Mullard metallised VP4B**), operates as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C26, L17, L18, C27** and **C28, L19, L20, C29.**

Intermediate frequency 130·5 KC/S.

Diode second detector is part of double diode triode valve (**V3, Mullard metallised TDD4**). Audio-frequency component in rectified output is developed across load resistance **R6** and passed via **C8,** manual volume control **R5** and I.F. stopper **R7** to C.G. of triode section. Tone control by variable condenser **C30** which shunts grid circuit.

Second diode of **V3,** fed from **V2** anode via **C12,** provides D.C. potential which is developed across **R11** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage is obtained from drop along **V3** cathode resistance **R8.**

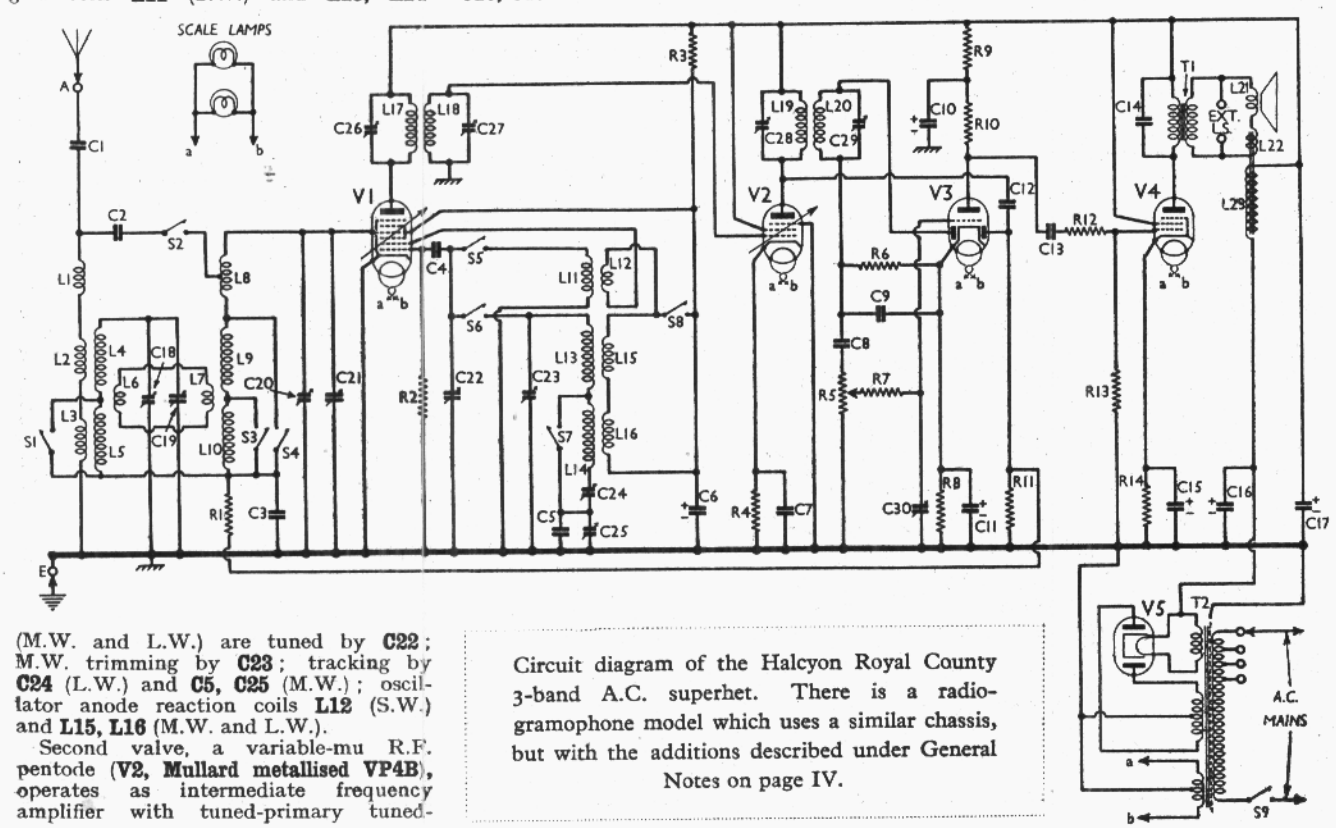
Resistance-capacity coupling by **R10, C13,** and **R13** between **V3** triode and pentode output valve (**V4, Mullard PenA4**). Fixed tone correction by anode condenser **C14.** Provision for connection of low impedance external speaker across **T1** secondary.

H.T. current is supplied by I.H.C. full-wave rectifying valve (**V5, Mullard IW4/350**). Smoothing by speaker field coil **L23** and dry electrolytic condensers **C16, C17.**

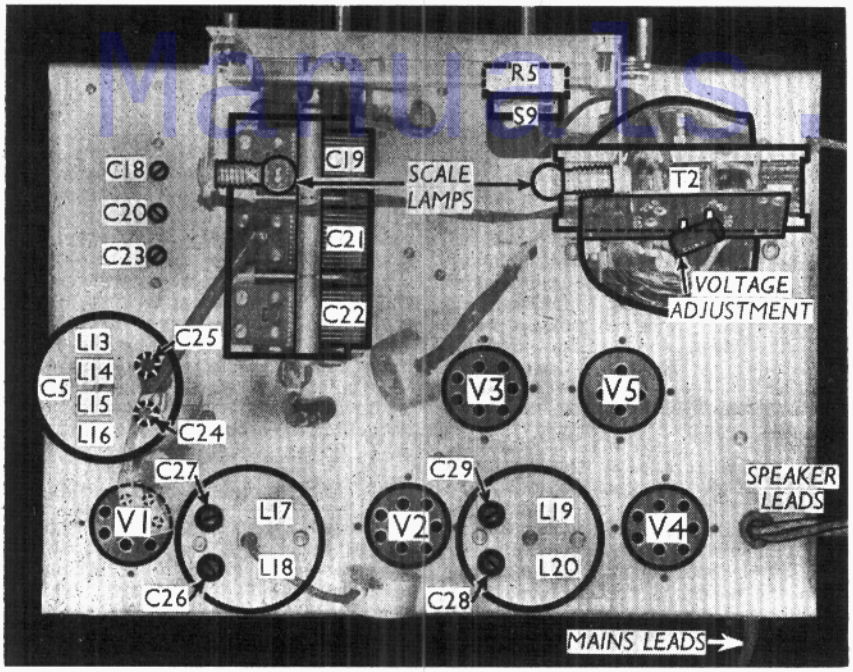
COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 pentode C.G. decoupling	1,000,000
R2	V1 osc. C.G. resistance	50,000
R3	V1 S.G.'s and osc. A decoupling	22,000
R4	V2 fixed G.B. resistance	300
R5	Manual volume control	1,000,000
R6	V3 signal diode load	100,000
R7	V3 C.G. I.F. stopper	250,000
R8	V3 G.B. resistance	1,000
R9	V3 triode anode decoupling	10,000
R10	V3 triode anode load	10,000
R11	V3 A.V.C. diode load	1,000,000
R12	V4 C.G. I.F. stopper	50,000
R13	V4 C.G. resistance	100,000
R14	V4 G.B. resistance	150

	CONDENSERS	Values (μF)
C1	Aerial series condenser	0·0005
C2	Aerial S.W. coupling	0·0005
C3	V1 pent. C.G. decoupling	0·25
C4	V1 osc. C.G. condenser	0·0001
C5	Osc. fixed M.W. tracker	0·0015
C6*	V1 S.G.'s and osc. A. decoupling	2·0
C7	V2 cathode by-pass	0·1
C8	V3 triode A.F. coupling	0·01
C9	I.F. by-pass	0·0001
C10*	V3 triode anode decoupling	2·0
C11*	V3 cathode by-pass	50·0
C12	V3 A.V.C. diode feed	0·0001
C13	V3 to V4 A.F. coupling	0·1
C14	Tone corrector	0·005
C15*	V4 cathode by-pass	50·0
C16*	H.T. smoothing	8·0
C17*		8·0
C18†	Band-pass primary trimmer	0·000035
C19†	Band-pass primary tuning	0·000456



Circuit diagram of the Halcyon Royal County 3-band A.C. superhet. There is a radio-gramophone model which uses a similar chassis, but with the additions described under General Notes on page IV.



Plan view of the chassis. Note the trimmers **C18, C20** and **C23,** reached through holes in the chassis.

CONDENSERS (*Continued*)		Approx. Values (μF)
C20‡	Band-pass secondary trimmer	0·000035
C21†	Band-pass secondary tuning	0·00456
C22†	Osc. circuit tuning	0·000456
C23‡	Osc. circuit M.W. trimmer ..	0·000035
C24‡	Osc. circuit L.W. tracker ..	0·00075
C25‡	Osc. circuit M.W. tracker ..	0·00075
C26‡	1st I.F. trans. pri. tuning ..	0·000175
C27‡	1st I.F. trans. sec. tuning ..	0·000175
C28‡	2nd I.F. trans. pri. tuning ..	0·000175
C29‡	2nd I.F. trans. sec. tuning ..	0·000175
C30†	Variable tone control ..	0·0005

* Electrolytic. † Variable. ‡ Pre-set.

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial choke coil	2·0
L2, L3	Aerial M.W. and L.W. coupling coils, total	4·5
L4, L5	Band-pass primary coils	2·6 / 28·5
L6, L7	Band-pass coupling coils	Very low / Very low
L8	Aerial S.W. tuning coil ..	Very low
L9, L10	Band-pass secondary coils	2·3 / 28·0
L11	Osc. S.W. tuning coil ..	Very low
L12	Osc. S.W. reaction coil ..	0·2
L13, L14	Osc. M.W. and L.W. tuning coils	2·2 / 20·0
L15, L16	Osc. M.W. and L.W. reaction coils, total	3·5
L17, L18	1st I.F. trans. Pri. .. / Sec. ..	65·0 / 65·0
L19, L20	2nd I.F. trans. Pri. .. / Sec. ..	65·0 / 65·0
L21	Speaker speech coil	1·5
L22	Hum neutralising coil	0·1
L23	Speaker field coil	1,750·0
T1	Speaker input trans. Pri. .. / Sec. ..	340·0 / 0·5
T2	Mains trans. Pri. total .. / Heater sec. .. / Rect. heat sec. / H.T. sec. total	29·0 / 0·05 / 0·1 / 550·0
S1-S8	Waveband switches	—
S9	Mains switch, ganged R5 ..	—

DISMANTLING THE SET

A detachable bottom is fitted to the cabinet and upon removal (four round-head wood screws) gives access to most of the under-chassis components.

Removing Chassis.—If it is necessary to remove the chassis from the cabinet, first remove the four control knobs (recessed grub screws), and then the four self-tapping bolts (with washers) holding the chassis to the bottom of the cabinet. Now unsolder the earthing lead from the tag on one of the speaker fixing screws, when the chassis can be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

To free the chassis entirely, unsolder the leads from the speaker and *when replacing*, connect the yellow/black lead to the bottom tag on the right of the transformer and the brown/yellow and green/yellow leads to the top tag. The other end of the brown/yellow lead goes to the top tag on the left of the speaker, and the red/yellow lead to the bottom tag.

Removing Speaker.—To remove the speaker from the cabinet, remove the nuts and lock washers from the three screws holding it to the sub-baffle. *When replacing*, see that the transformer is on the right and do not forget to place the tag for the earthing lead on the top right-hand screw. Connect the leads from the extension speaker panel to tags 1 and 2 (numbered from bottom to top) on the left of the transformer.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 230 V, using the 240 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the medium band and the volume control was at maximum, but there was no signal input.

Voltages were measured on the 1,200 V scale of an Avometer, with chassis as negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 FC4 ..	235	2·5	90	4·1
V2 VP4B ..	235	9·3	235	3·4
V3 TDD4	150	3·8	—	—
V4 PenA4	220	33·0	235	4·2
V5 IW4/350	295	—	—	—

Oscillator anode 90 V, 2·5 mA.
Each anode, A.C.

GENERAL NOTES

Switches.—S1-S8 are the wavechange switches, ganged in a single unit beneath the chassis. The table (p. IV) gives the switch positions for the three control settings, starting from fully anti-clockwise. O indicates open and C closed.

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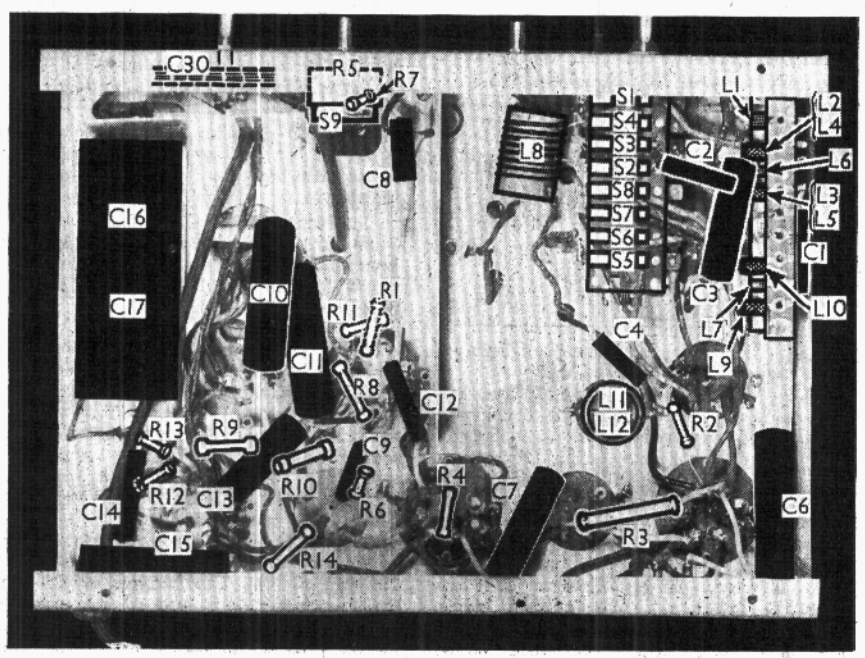

Under-chassis view. **R1** is inside insulating sleeving. All the switches are clearly marked.

MAINTENANCE PROBLEMS

Loose Solder Causes S.C.

A RATHER puzzling fault occurred in connection with an R.G.D. Model 630 console just placed in stock.

Whilst testing the receiver, which had behaved well on long and medium wavebands, I switched over to the short-wave band and found that no signals were being received; on switching back to medium and long the set was dead on these bands also.

All valves were tested and found O.K. and on removing the chassis, and laying it on its side, I found that a light tap on one of the wires connected to the ganged condensers brought the set back to life again.

I could find no fault with the soldering of this wire, but noticed that although the set refused to function in the normal position, it would work on its side, cutting out when at an angle of 45 degrees.

To cut a long story short, I eventually discovered a blob of solder hanging pendulum fashion from the under-side of the ganged condenser. Evidently it shorted the condenser to chassis when the chassis was in its usual position, and swung clear when the chassis was turned on its side.

This is not exactly a technical hint, and it may be that I was slow to find the trouble, for it took me the best part of an hour. If it will save any service engineer's time in future, I shall be pleased.—R. BLAIN, STOKE-ON-TRENT.

Hum with a Pick-up

A 3-valve (plus rectifier) A.C. radio-gramophone of unknown pedigree worked well on radio; gramophone reproduction being marred by a loud hum. The leads from the pick-up were plugged into two sockets mounted on the chassis. One of these sockets was connected to one side of the output valve heater socket which in turn was connected to the corresponding sockets of the other two valve heaters, and earthed to the chassis.

Although this lead was quite short and of 16 s.w.g. tinned copper wire, it was found that when the pick-up socket was earthed direct to the chassis, the hum stopped.—G. A. GAMLEN, COLCHESTER.

Screened Coil Unit Fault

A PHILIPS 745A was demonstrated in the shop, and as the customer for some reason wanted the particular one he heard, the set was duly delivered to his home. On connecting up no signals were heard on any wavelength. After taking the set back, and connecting up on the bench, the set behaved quite normally, so we decided to leave it running. About half-an-hour had elapsed when there was a "plop" and silence.

Making the usual tests on the valves for loose electrodes, the faulty one, or at least so we supposed, was the double diode 2D4A. Tapping this gently brought signals back to normal, so we inserted a new valve, but the same thing happened again. By tapping this valve the set was intermittently normal.

All coils, condensers and resistances were tested and found O.K., so we came to the conclusion that there was a loose connection somewhere in the vicinity of the 2D4A valve. This was traced to the 2nd I.F. coil unit, and as service engineers know, these are not meant to be taken off, by the way they are fastened.

On making continuity tests of this coil it was found that by pressing the case, the resistance of the secondary was infinitesimal, so we decided to open up the can, as this seemed too small a fault to return to the makers. The construction of these cans is another point where the manufacturers should have more consideration for service engineers.

After the coil was taken from the can the fault was obvious—a large blob of solder across the two tags of the secondary winding. Evidently moving the cabinet about cause the chassis to shift sufficiently to open the S.C. which would then, after about half-an-hour or so, for some unaccountable reason decide to S.C. again.—A. E. LOVELL, BEDFORD.

Bad Contact to Chassis

ANOTHER elusive fault with a Philips 745A was a complaint that when put on full volume, a continuous crackle was heard. This set was brought in for servicing, connected up on the bench, and it ran for several hours with the volume control fully advanced, and was still O.K.

The chassis was removed for loose connection tests, but still no fault was found, so we decided that there must be some outside fault which was heard only when the volume control was turned on full. However, during the final tests, the earth lead was accidently pulled out, and then the noise began.

This eventually was found to be due to all the coil cans not being fastened tight enough to the chassis. Incidentally, I should like to know how the manufacturers expect us to tighten these when necessary, as using a hammer and punch made no impression on the looseness, and eventually we had to use nuts and bolts through the cleat holes to make a good job.—A. E. LOVELL, BEDFORD.

HALCYON ROYAL COUNTY *Continued*

Switch	S.W.	M.W.	L.W.
S1	C	C	O
S2	C	O	O
S3	C	C	O
S4	C	O	O
S5	C	O	O
S6	O	C	C
S7	C	C	O
S8	C	O	O

S9 is the Q.M.B. mains switch, ganged with the volume control **R5.**

Coils.—**L1-L7** and **L9, L10** are unscreened, and are mounted on a common cylindrical former beneath the chassis. The various coils are indicated in our under-chassis view. **L8,** and **L11, L12** are on two tubular formers, also beneath the chassis. **L12** is the finer wire winding of the two.

L13-L16, and the I.F. transformers **L17, L18** and **L19, L20** are in three screened units on the chassis deck. The first of these contains **C5,** besides the trimmers **C24, C25.** A fibre cover normally fits over the holes through which the latter are adjusted.

Scale Lamps.—These are two Osram 6·2 V, 0·3 A M.E.S. types.

External Speaker.—Two sockets are provided on a panel mounted at the top of the back of the cabinet for a low resistance (1·5-2·5 O) external speaker.

Condensers C16, C17.—These are two 8 μF dry electrolytics in a single carton beneath the chassis, with a common negative (black) lead. The red lead is the positive of **C16** and the yellow the positive of **C17.**

Radiogram Models.—In the radiogram a similar chassis is fitted, but with some additions. There is an extra switch unit for radio-gram switching. This contains three switches. One is connected in series with the H.T. line between the points where the top of **L19** and the top of **R9** connect to it. This switch opens on gram. and mutes radio. The junction between **C8** and **R5** is broken, and one side of each of the other two switches goes to the top of **R5.** The bottom of **C8** goes, to the other side of one of the switches and the other side of the remaining switch goes to an extra 0·0003 μF fixed condenser. The other side of this condenser goes to the pick-up, and the other connection of the pick-up is taken to chassis. On radio, **C8** and **R5** are joined, while on gram. the pick-up output is fed, via the extra condenser, to the top of **R5.**

CIRCUIT ALIGNMENT

I.F. Circuits.—Feed a 130·5 KC/S signal to **V1** control grid (top cap) and chassis, and adjust **C29, C28, C27** and **C26** in that order for maximum output.

R.F. and Oscillator Circuits.—Scale pointer should cover the 50 m. mark on the scale when gang is at maximum.

Switch set to M.W., tune to 250 m. on scale, feed a 250 m. signal into **A** and **E** sockets and adjust **C23** for maximum output. If there are two peaks, that with the trimmer nearest its minimum position is correct. Now adjust **C20** and **C18** for maximum output.

Feed in a 500 m. signal, tune it in, and adjust **C25** for maximum output, rocking the gang meanwhile for optimum results.

Switch set to L.W., feed in an 1,800 m. signal, and tune to 1,800 m. on scale. Adjust **C24** for maximum output, while rocking the gang slightly.

No S.W. adjustments are provided.